Working Memo 449

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TO: Division Staff

THROUGH: Allen R. Hammer, Director
Bureau of Water Supply Engineering

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FROM: Thomas B. Gray, Assistant Technical Services Chief
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SUBJECT: Water - Design - Equipment - McLean Fe & Mn Filters

After pilot testing in Goochland County (Camp Hilbert) this process has been found acceptable for use in Virginia. John O. McLean, McLean Engineering Inc., 109 Barksdale Road, Richmond, Virginia 23231, holds U.S. patent number 3,649,532 on this process. Mr. McLean also retains marketing rights for Virginia, West Virginia and Maryland. Chemical Engineering Corporation, Churubusco, Indiana 46723, has marketing rights for the rest of the U.S. and some foreign countries. This process is guaranteed to work or McLean will refund purchase price. This "self-bonding" will be part of our approval requirements. This process is composed of two components: addition of air and a bed-type filter containing a special filter media. This media has two jobs: (1) increase raw water pH and (2) filter out precipitated iron and manganese. Hardness will also be raised. There is no chemical addition to this process except the filter media may need a small makeup volume each year. Flow rate through the filter was our usual 3 gpm/ft.^{2}. Attached is a copy of McLean's literature brochure containing additional information. Test results indicate 96-98% Fe and 53-75% Mn removal on water with 5 ppm Fe, and 0.15 gpm Mn. This system supposedly will work on water containing 30 ppm Fe. This system supposedly removes small amounts (< 3 ppm) of hydrogen sulfide, but this aspect was not tested.

TBG/teh
Enclosure

Questions & Answers

On the New MacCLEAN
iron removal system

Q. How long does the backwashing procedure take?

A. Most applications require only 4 to 5 minutes for backwashing and rapid rinse. (To be conservative, automatic equipment is factory set at 6 minutes for backwashing and 2 minutes for rapid rinse, for a total of 8 minutes.)

Q. How often does the MacClean need to be backwashed?

A. This depends on the water usage and the iron concentration in the water. For example, a family of four with water containing 6 PPM of iron will need to backwash every 12 days if an automatic backwashing model. Manual backwashing models will need to be backwashed every two weeks.

Q. How much water is required to backwash the unit?

A. With factory settings, which cover most applications, a one cu. ft. MacCLEAN requires only 40 gallons of water. This compares very favorably to oxidizing filters using potassium permangranate which require from 175 gallons to 300 gallons of water to regenerate--and on a more frequent schedule.

Q. What is the capacity of iron removal between backwashings?

A. The most popular size - the one cu. ft. model - has a nominal capacity of 30,000 PPM, though actual capacity may be far higher. This figure is especially impressive when compared to an oxidizing filter with an iron removal capacity of only 8,000 PPM (mg/1).

Q. What about pressure drop through the system?

A. Pressure drop is comparable to that experienced with a greensand filter.

Q. What are required flow rates to backwash the filter bed?

A. A minimum of 5 G.P.M. actual pumping rate is required to backwash the one cu. ft. model. Greater pumping rates are required on larger models.

Q. What about hydrogen sulfide (sulfur) removal?

A. While not intended for this purpose, the Mac-Clean is capable of removing small amounts of sulfur (generally 3 PPM or less); however, no warranties concerning its removal are extended, since sulfur can vary greatly from a given well.

Q. What is the MacCLEAN Filter System?

A. Very simply, the MacCLEAN is a newly introduced patented system for removal of iron from water.

Q. How does it work?

A. The system consists of two components: a "Hydrocharger" and a bed-type filter containing a special filter media. The Hydro-charger, a small brass device, is located in the water line between the well and the pressure tank. When water is drawn from the well, it passes through the hydro-charger, which increases the velocity of a portion of the water stream. This causes the iron in the water to change into a colloidal form (very small insoluble particles). After passing through the pressure tank the colloidal iron is collected by the media, which has an attraction to the colloidal iron. Periodically the media bed is backflushed (backwashed) to the drain

which rids it of the iron. It is then ready for use once again.

Q. Does the MacCLEAN use any chemicals?

A. It requires ab solutely no chemicals at any time.

Q. How effective is your product for removal of iron?

A. Very effective. We have subjected it to the most difficult water conditions imaginable with virtually perfect results. We have yet to find any application where it has failed to perform, except where correct installation procedures were not followed, or pumping rate was insufficient.

Q. Will it remove all types of iron?

A. Yes, it effectively removes iron from water containing ferrous (dissolved), ferric (precipitated or "red water"), and bacterial iron (forms slimy, gelatinous growth in flush tanks).

Q. What is the highest iron concentrations it will remove?

A. It performs perfectly on water containing over 30 PPM of iron. To our knowledge, there is no maximum limit. We are constantly monitoring new installations on water of unusual characteristics.

Q. Will it function on acid water (low pH) without a neutralizer?

A. Yes, Unlike typical oxidizing filters, the pH does not have to be neutral or higher. In fact, the MacCLEAN raises pH if it is below 7, the amount of adjustment dependent on the pre-treated water pH level.

Q. What is the filter media?

A. The media consists of a blend of special natural media, portions of which are not commonly used for water treatment. It contains no manganese greensand, manganese treated sodium aluminosilcate (Aridsorb ™) or Birm ™.

Q. Will the filter bed "wear out" and need replacing?

A. The filter media does not wear out if normally cared for, but will experience a slight attrition each year, as does high capacity softening resin or any other water treatment media. Because of the conservative capacities used in product specifications, no media need be added for many years to restore capacity.

Q. What about the affect of acid water (low pH) on the filter media?

A. The media is modestly sacrificial on low pH, and depending on the pH, may need "topping off" after several years.

Q. Can a MacCLEAN be placed on a public water supply or community water system at the point-of-use?

A. Yes, but a pressure tank must be added to the system after the Hydro-charger. This is necessary to insure water passes through the Hydro-charger at sufficient velocity.

Q. Are all types of pressure tanks acceptable?

A. Yes, but a bladder type will require more careful adjustment of the Hydro-charger.

Q. Will the MacCLEAN work on commercial and industrial applications?

A. Yes. Systems have been engineered for applications operating at 300 gallons per minute, and function on the same principles.

Q. Does anyone else have the right to manufacture or market iron removal equipment based on the principles of the MacCLEAN System.

A. At this time, no Chemical Engineering Corporation holds the exclusive license on the patent.

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CHEMICAL ENGINEERING CORPORATION
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